**MASTER 2 Neurosciences Fondamentales et Cliniques****Internship proposal 2021-2022**

(internship from January to end of May 2022)

Host laboratory: Institut des Sciences Cognitives, UMR 5229 CNRS/UCBL, 67 Bd Pinel, 69675 Bron, France

Website: <http://isc.cnrs.fr>

Host team : Decision, Action, and Neural Computation (DANC) team

Website: <https://www.danclab.com/>

Internship supervisors :

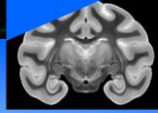
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Project title : Developmental trajectory and functional role of beta bursts**Project summary :**

Everyday actions involve an intricate interplay between sensory integration, muscle coordination, and movement evaluation processes. These processes are not fully developed in newborns, but young infants spontaneously make arm movements toward objects in their sight. These arm movements lead to the development of object-directed reaching and then grasping, which continues throughout childhood. Grasping in development seems to increasingly utilize visual information to direct the reach and pre-program the grasp. Infants starting at 7 months old begin to pre-orient their hands to match an object's orientation, and by 9 months old, infants increase reach and grasp efficiency. This project will involve testing the hypothesis that developmental changes in grasping ability correspond to increasing reliance on internal, predictive models for reaching and grasping. Motor activity in the beta band is hypothesized to be a signature of these internal models, and to be shaped by projections to the motor cortex from the thalamus and other cortical regions. This project will be part of a longitudinal study of infants in the first year of life, involving MRI/DTI, EEG,

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and behavioral tests. EEG will be used to record infant brain activity during reaching and grasping actions to analyze beta activity, DTI will be acquired to track the developmental myelination of cortico-cortical and thalamo-cortical fiber tracts projecting to the primary motor cortex, and videos of infant and caregiver object-directed actions will be recorded to analyze the development of reach-and-grasp kinematics. The results from this project are expected to provide a framework for future studies aimed at identifying biomarkers for early diagnosis of atypical sensorimotor development and the development of effective interventions for developmental disorders characterized by aberrant beta activity.

3-5 recent publications :

Bonaiuto JJ, Little SJ, Neymotin SA, Jones SR, Barnes GR, Bestmann S. (under review) Laminar dynamics of beta bursts in human motor cortex. bioRxiv doi:

<https://www.biorxiv.org/content/10.1101/2021.02.16.431412v1>.

Bunday* KL, Bonaiuto* JJ, Betti S, Lemon RN, Orban G, Davare M. (under review) Mapping connectivity between the premotor cortex and contralateral primary motor cortex. bioRxiv doi: <https://doi.org/10.1101/743351>.

Bonaiuto JJ, Afdideh F, Ferez M, Wagstyl K, Mattout J, Bonnefond M, Barnes GR, Bestmann S. (2020) Estimates of cortical column orientation improve MEG source inversion. bioRxiv doi: <https://doi.org/10.1101/810267/>, NeuroImage, 26(1): 116862.

Little S, Bonaiuto J, Barnes G, Bestmann S. (2019) Human motor cortical beta bursts relate to movement planning and response errors. bioRxiv doi: <https://doi.org/10.1101/384370>, PLoS Biology, 17(10): e3000479

Bonaiuto JJ, Meyer SS, Little SJ, Rossiter HE, Callaghan MF, Dick F, Barnes GR, Bestmann S (2018) Lamina-specific cortical dynamics in human visual and sensorimotor cortices. bioRxiv doi: <https://doi.org/10.1101/226274>, eLife, e33977.